MODEL

AD-1507 CD-4 Demodulator Module

HEATHKIT®

ASSEMBLY MANUAL

HEATH COMPANY • BENTON HARBOR, MICHIGAN

Model AD-1507 CD-4 Demodulator Module

HEATHKIT

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I-595-1765-02

HEATH COMPANY PHONE DIRECTORY

The following telephone numbers are direct lines to the departments listed:

Kit orders and delivery information	(616) 982-3411
Credit	(616) 982-3561
Replacement Parts	(616) 982-3571
Technical Assistance:	
R/C, Audio, and Electronic Organs	(616) 982-3310
Amateur Radio	(616) 982-3296
Test Equipment, Strobe Lights, Calculators, Clocks, Weather Instruments	(616) 982-3315
Television	(616) 982-3307
Automotive, Marine, Appliances, Security, General Products	(616) 982-3496

YOUR HEATHKIT 90-DAY FULL WARRANTY

If you are not satisfied with our service - warranty or otherwise - or with our products, write directly to our Director of Customer Services, Heath Company, Benton Harbor, Michigan 49022. He will make certain your problems receive immediate, personal attention.

Our attorney, who happens to be quite a kitbuilder himself, insists that we describe our warranty using all the necessary legal phrases in order to comply with the new warranty regulations. Fine. Here they are:

For a period of ninety (90) days after purchase, Heath Company will replace or repair free of charge any parts that are defective either in materials or workmanship. You can obtain parts directly from Heath Company by writing us at the address below or by telephoning us at (616) 982-3571. And we'll pay shipping charges to get those parts to you — anywhere in the world.

We warrant that during the first ninety (90) days after purchase, our products, when correctly assembled, calibrated, adjusted and used in accordance with our printed instructions, will meet published specifications.

If a defective part or error in design has caused your Heathkit product to malfunction during the warranty period through no fault of yours, we will service it free upon proof of purchase and delivery at your expense to the Heath factory, any Heathkit Electronic Center (units of Schlumberger Products Corporation), or any of our authorized overseas distributors.

You will receive free consultation on any problem you might encounter in the assembly or use of your Heathkit product. Just drop us a line or give us a call. Sorry, we cannot accept collect calls.

Our warranty does not cover and we are not responsible for damage caused by the use of corrosive solder, defective tools, incorrect assembly, misuse, fire, or by unauthorized modifications to or uses of our products for purposes other than as advertised. Our warranty does not include reimbursement for customer assembly or set-up time.

This warranty covers only Heathkit products and is not extended to allied equipment or components used in conjunction with our products. **We are not responsible for incidental or consequential damages.** Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

HEATH COMPANY
BENTON HARBOR, MI. 49022

Prices and specifications subject to change without notice.

Assembly and Operation of the HEATHKIT®

CD-4 DEMODULATOR MODULE

MODEL AD-1507

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BENTON HARBOR, MICHIGAN 49022

INTRODUCTION

The CD-4 Demodulator Module, when used with compatible Heathkit units, enables the user to reproduce four discrete channels of audio information from CD-4 discs. When these discs are played on a suitable record player, with a CD-4 magnetic cartridge, the separation characteristics may be compared to those achieved on four-channel discrete tape recordings. Unlike matrix systems where there is a phase relationship between the channels, the CD-4 system produces four entirely independent channels of information.

This CD-4 system uses a 28-pin, large-scale, linear integrated circuit for each channel. The integrated circuit does most of the amplifying, detection, and noise suppression that was done with many separate components in earlier CD-4 decoders. This integrating of parts greatly simplifies the building of the kit as well as improves the quality of the detected information when compared to earlier decoders. The quality of this decoder is also enhanced by LC filters that prevent any unwanted signals from reaching the output.

Refer to the Kit Builders Guide for complete information on unpacking, parts identification, tools, wiring, soldering, and step-by-step assembly procedures.

PARTS LIST

Check each part against the following list. Make a check (√) in the space provided as you identify each part.

To order a replacement part, always include the PART NUMBER. Use the Parts Order Form furnished with this kit. If a Parts Order Form is not available, refer to "Replacement Parts" inside the rear cover of the Manual. Your Warranty is located inside the front cover. For pricing information, refer to the separate "Heath Parts Price List."

Since this circuit board contains two identical circuits, the corresponding components in each circuit will have the same component number. This means, for example, the circuit board will have two resistors called R1301.

Use these component numbers when you want to positively identify the same part in the various sections of the Manual. These numbers, which are especially useful if a part has to be replaced, appear:

- In the Parts List,
- At the beginning of each step where a component is installed,
- In some illustrations,
- In the sections at the rear of the Manual.

KEY No.	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

RESISTORS

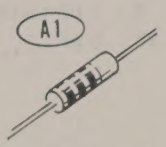
NOTES:

1. The resistors may be packed in more than one envelope. Open all the resistor envelopes in this pack before you check them against the Parts List.

2. The following resistors have a tolerance of 5% unless they are listed otherwise. 5% is indicated by a fourth color band of gold, while 10% is indicated by a silver band.

1/2-Watt

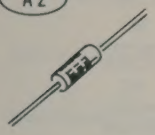
A1 ( )	1	10 Ω (brown-black-black)	1-173	R1356
A1 ( )	2	15 Ω (brown-green-black)	1-54	R1309
A1 ( )	1	22 Ω (red-red-black)	1-171	R1355
A1 ( )	2	330 Ω (orange-orange-brown)	1-151	R1314
A1 ( )	1	560 Ω (green-blue-brown)	1-95	R1354
A1 ( )	1	1000 Ω (brown-black-red)	1-172	R1353
A1 ( )	10	2200 Ω (red-red-red)	1-57	R1306, R1312, R1313, R1335, R1336
A1 ( )	2	3300 Ω (orange-orange-red)	1-122	R1325
A1 ( )	8	4700 Ω (yellow-violet-red)	1-43	R1311, R1321, R1322, R1323
A1 ( )	4	6800 Ω (blue-gray-red)	1-51	R1317, R1318
A1 ( )	2	8200 Ω (gray-red-red)	1-114	R1315
A1 ( )	2	10 kΩ (brown-black-orange)	1-105	R1301
A1 ( )	10	15 kΩ (brown-green-orange)	1-133	R1305, R1307, R1319, R1328, R1329
A1 ( )	2	27 kΩ (red-violet-orange)	1-124	R1324
A1 ( )	2	39 kΩ, 10% (orange-white-orange)	1-67	R1332
A1 ( )	8	47 kΩ (yellow-violet-orange)	1-115	R1302, R1303, R1333, R1334
A1 ( )	5	100 kΩ (brown-black-yellow)	1-104	R1303, R1331, R1352
A1 ( )	3	150 kΩ (brown-green-yellow)	1-107	R1304, R1351
A1 ( )	2	220 kΩ (red-red-yellow)	1-59	R1327



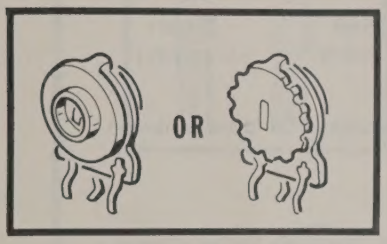
KEY No.	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.
1/4-Watt				
A2 ( )	2	4700 Ω (yellow-violet-red)	1-76-12	R1326
CONTROLS				
B1 ( )	2	500 Ω	10-918	R1308
B1 ( )	2	5000 Ω (5k)	10-311	R1316
CAPACITORS				
Disc				
C1 ( )	6	100 pF	21-75	C1306, C1324, C1325
C1 ( )	4	.01 μF	21-176	C1308, C1314
Electrolytic				
C2 ( )	2	1 μF tantalum	25-197	C1322
C3 ( )	13	5 μF	25-149	C1301, C1302, C1307, C1315, C1326, C1327, C1351
C4 ( )	2	10 μF tantalum	25-220	C1319
C4 ( )	2	33 μF tantalum	25-253	C1323
C5 ( )	2	50 μF	25-116	C1352, C1353
C5 ( )	2	250 μF	25-160	C1305
Mylar*				
NOTE: Mylar capacitors can be marked three different ways. EXAMPLE: .47, .47 k, or .47 μF. However, the Parts List and installation instructions will always use μF.				
C6 ( )	2	.0022 μF (2200 pF)	27-41	C1318
C6 ( )	2	.0027 μF (2700 pF)	27-141	C1312
C6 ( )	2	.0047 μF (4700 pF)	27-104	C1304
C6 ( )	2	.022 μF	27-128	C1303
C6 ( )	2	.033 μF	27-138	C1311
C6 ( )	2	.47 μF	27-86	C1309
C6 ( )	2	.68 μF	27-62	C1317
Polystyrene				
C7 ( )	6	6800 pF (.0068 μF or 6.8 μ)	29-32	C1313,C1316, C1321

*DuPont Registered Trademark

A2

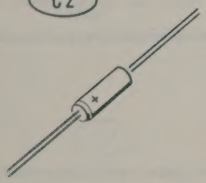


B1

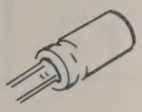


C1

C2



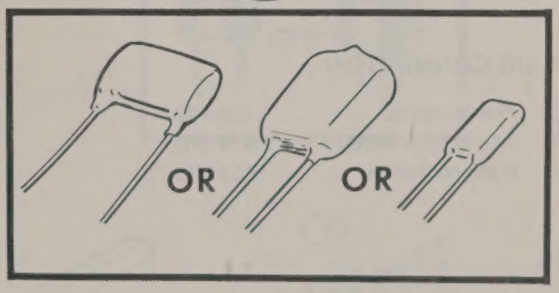
C3



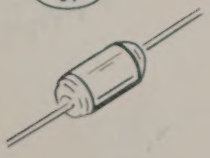
C4

C5

C6



C7



KEY No.	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

DIODES-TRANSISTOR-INTEGRATED CIRCUIT

D1 ( )	2	1N4149 silicon diode	56-56	D1301
D1 ( )	1	1N4744A zener diode	56-620	ZD1351

NOTE: Transistors and integrated circuits are marked for identification in one of the following four ways.

1. Part number.
2. Type number. (In integrated circuits this refers only to the numbers; the letters may vary.)
3. Part number and type number.
4. Part number with a type number other than the one listed.

D2 ( )	1	2N3702 transistor	417-808	Q1351
D3 ( )	2	QSI 5022 CD-4A integrated circuit	442-605	IC1301

FILTERS-COIL

E1 ( )	2	15 kHz low pass filter	52-173	FL1301
E2 ( )	2	30 kHz bandpass filter	52-174	FL1302
E3 ( )	2	100 mH coil	40-1808	L1301

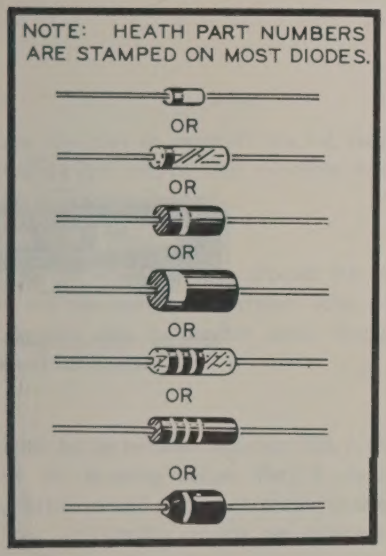
SOCKETS-PLUG-CONNECTOR

F1 ( )	2	Phono socket	434-186
F2 ( )	4	14-pin strip socket	434-300
F3 ( )	1	8-pin connector	432-876

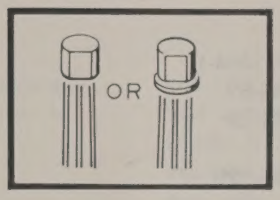
HARDWARE

G1 ( )	1	6-32 x 3/8" screw	250-89
G2 ( )	1	6-32 locknut	252-27
G3 ( )	2	#8 flat washer	253-45

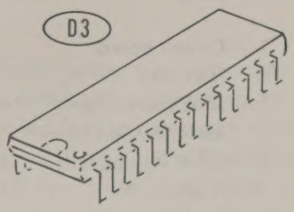
D1



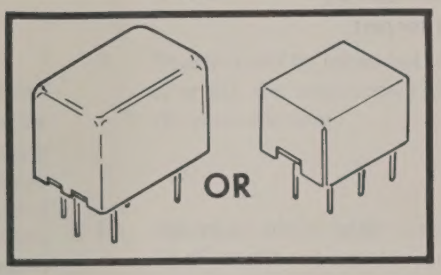
D2



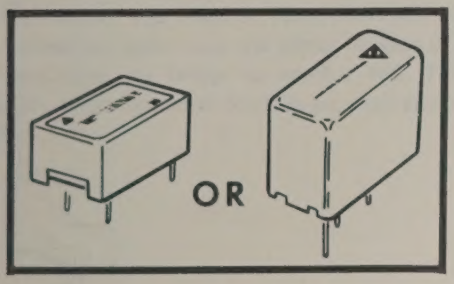
D3



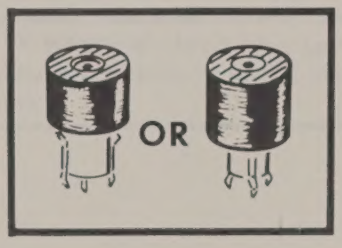
E1



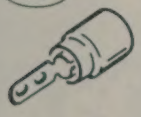
E2



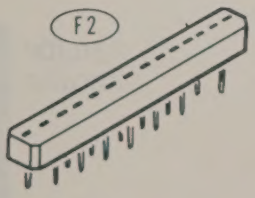
E3



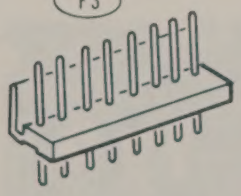
F1



F2



F3



G1

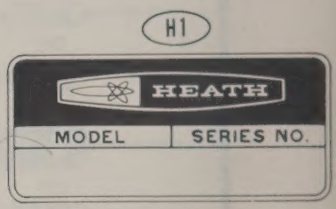
G2

G3

KEY No.	QTY.	DESCRIPTION	PART No.	CIRCUIT Component No.

MISCELLANEOUS

( )	1	Circuit board	85-1654-1	
( )	18"	Red wire	344-52	
H1 ( )	1	Blue and white identification label	391-34	
( )	1	CD-4 Adjustment record	449-120	
( )	1	Parts Order Form	597-260	
( )	1	Kit Builders Guide	597-308	
( )	1	Assembly Manual (See front cover for part number.)		
		Solder		



ASSEMBLY NOTES

1. Before you start to assemble this kit, read the wiring, soldering, and step-by-step assembly information in the "Kit Builders Guide."

2. Due to the small foil area around the circuit board holes and the small areas between foils, you must use the utmost care to prevent solder bridges between adjacent foil areas.

   A solder bridge between adjacent foils is shown in Part A of the drawing below. Part B shows how the connection should appear. A solder bridge may occur if you accidentally touch an adjacent previously soldered connection, if you use too much solder, or if you "drag" the soldering iron across other foils as you remove it from the connection. A good rule to follow is: Always take a good look at the foil area around each lead before you solder it. Then, when you solder the connection, make sure the solder remains in this area and does not bridge to another foil. This is especially important when the foils are small and close together.

   Use only a minimum amount of solder and do not heat components excessively with the soldering iron. Diodes, transistor, etc., can be damaged if subjected to excessive amounts of heat. Use a 40-watt soldering iron with a small tip. Allow it to reach operating temperature, and then apply it only long enough to make a good solder connection.

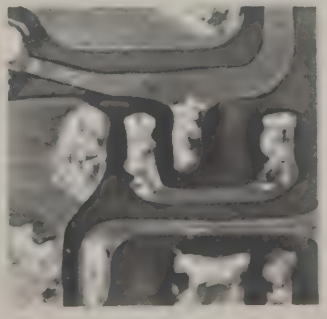
3. Resistors will be called out by their resistance value in Ω or kΩ, and color code. Use 1/2-watt resistors unless directed otherwise.

4. Capacitors will be called out by their capacitance value (in pF or μF) and type (disc, mica, Mylar, polystyrene, or electrolytic).

SAFETY WARNING: Avoid eye injury when you cut off excess lead lengths. Hold the leads so they cannot fly toward your eyes.

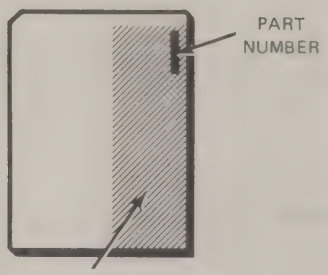
A

B



STEP-BY-STEP ASSEMBLY

IDENTIFICATION DRAWING



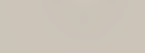
The steps performed in this Pictorial are in this area of the circuit board.

START

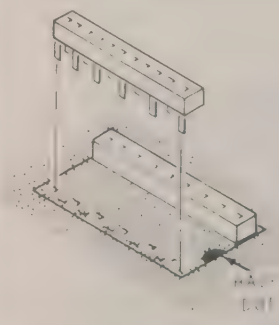
NOTE: Only part of the circuit board is shown in the following Pictorials. The shaded area in an identification drawing at the top of each Pictorial shows the area of the circuit board to be assembled.

( ) Position the circuit board, component side up as shown. Then complete each step on the Pictorial.

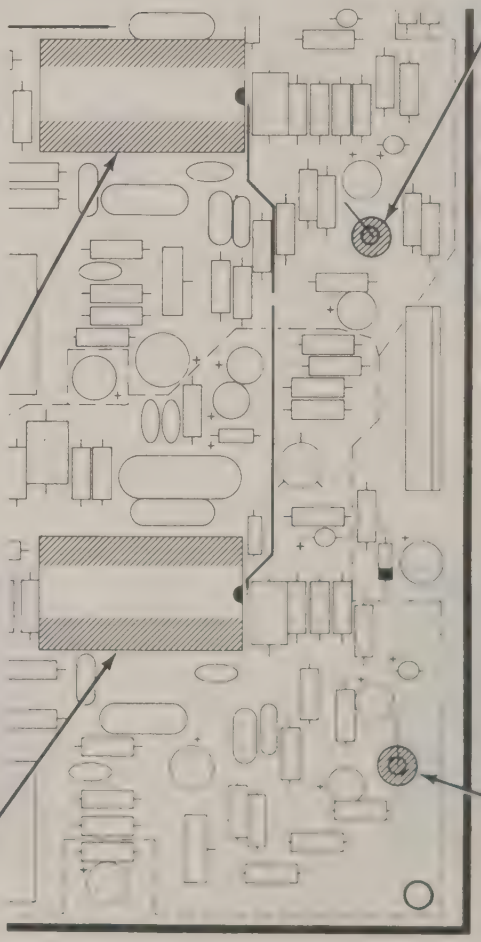
FOR GOOD SOLDER CONNECTIONS, YOU MUST **KEEP THE SOLDERING IRON TIP CLEAN.** WIPE IT OFTEN WITH A DAMP SPONGE OR CLOTH.



( ) Two 14-pin strip sockets. Be sure the leads are straight. Then insert the leads of each strip socket into the holes and solder the leads to the foil.



( ) Two 14-pin strip sockets.

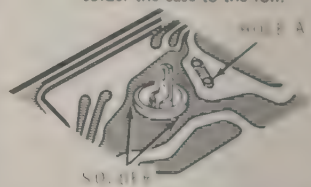


CONTINUE

( ) Phono socket. Install the socket as follows:

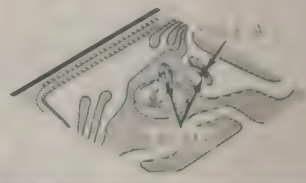
1. Insert the socket into the indicated hole from the component side of the circuit board.

2. Turn the circuit board over and rotate the socket so the lug is toward hole A. Then solder the case to the foil.



NOTE: When bare wire is called for in a step, cut the red wire to the specified length. Then remove all of the insulation from the wire.

( ) Connect a 3/4" bare wire from the center tab of the phono socket just installed to circuit board hole A. Solder the wire to the foil and the tab.

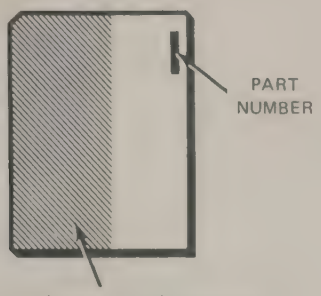


( ) Similarly, insert the other phono socket with the lug turned toward hole A. Solder the case to the foil.

( ) Connect a 3/4" bare wire from the center tab of the phono socket to circuit board hole A. Solder the wire to the foil and the tab.

PICTORIAL 1-1

IDENTIFICATION DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

START

NOTE: Most of the following resistors have a gold fourth band. This fourth band will not be called out unless it is other than gold.

( ) R1321: 4700 Ω (yellow-violet-red).

( ) R1315: 8200 Ω (gray-red-red).

( ) R1314: 330 Ω (orange-orange-brown).

( ) R1317: 6800 Ω (blue-gray-red).

( ) R1352: 100 kΩ (brown-black-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R1321: 4700 Ω (yellow-violet-red).

( ) R1315: 8200 Ω (gray-red-red).

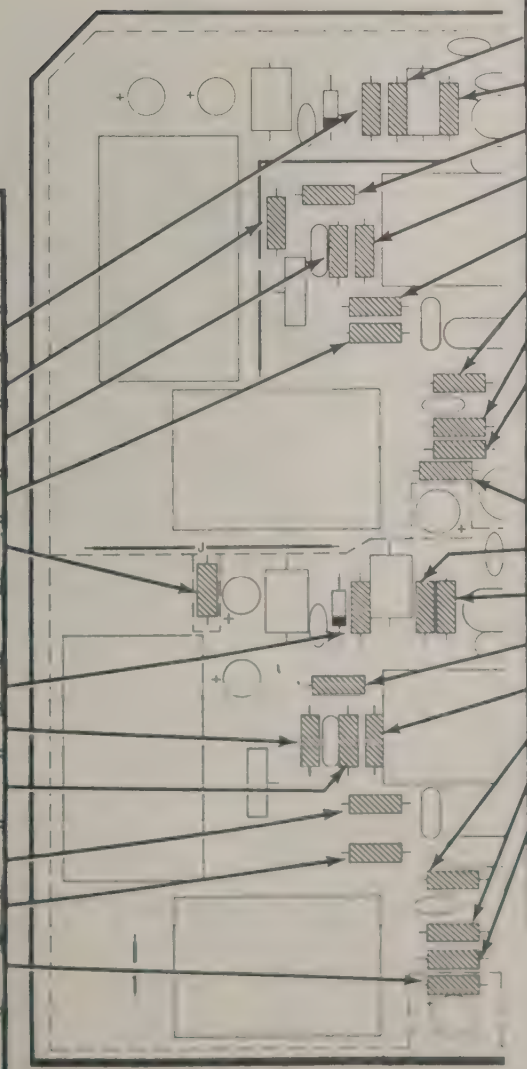
( ) R1314: 330 Ω (orange-orange-brown).

( ) R1319: 15 kΩ (brown-green-orange).

( ) R1317: 6800 Ω (blue-gray-red).

( ) R1351: 150 kΩ (brown-green-yellow).

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) R1323: 4700 Ω (yellow-violet-red).

( ) R1324: 27 kΩ (red-violet-orange).

( ) R1322: 4700 Ω (yellow-violet-red).

( ) R1318: 6800 Ω (blue-gray-red).

( ) R1319: 15 kΩ (brown-green-orange).

( ) R1311: 4700 Ω (yellow-violet-red).

( ) R1312: 2200 Ω (red-red-red).

( ) R1309: 15 Ω (brown-green-black).

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) R1313: 2200 Ω (red-red-red).

( ) R1323: 4700 Ω (yellow-violet-red).

( ) R1324: 27 kΩ (red-violet-orange).

( ) R1322: 4700 Ω (yellow-violet-red).

( ) R1318: 6800 Ω (blue-gray-red).

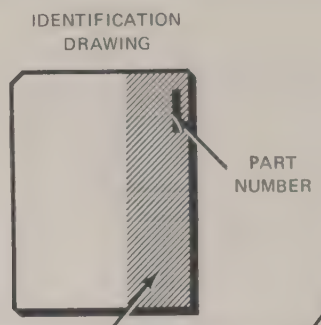
( ) R1311: 4700 Ω (yellow-violet-red).

( ) R1312: 2200 Ω (red-red-red).

( ) R1313: 2200 Ω (red-red-red).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-2



The steps performed in this Pictorial are in this area of the circuit board.

START

- ( ) R1331: 100 kΩ (brown-black-yellow).
- ( ) R1327: 220 kΩ (red-red-yellow).
- ( ) R1326: 4700 Ω, 1/4-watt (yellow-violet-red).
- ( ) R1328: 15 kΩ (brown-green-orange).
- ( ) R1329: 15 kΩ (brown-green-orange).
- ( ) R1302: 47 kΩ (yellow-violet-orange).
- ( ) R1307: 15 kΩ (brown-green-orange).
- ( ) R1304: 150 kΩ (brown-green-yellow).
- ( ) R1305: 15 kΩ (brown-green-orange).
- ( ) R1306: 2200 Ω (red-red-red).
- ( ) R1334: 47 kΩ (yellow-violet-orange).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R1331: 100 kΩ (brown-black-yellow).
- ( ) R1335: 2200 Ω (red-red-red).
- ( ) R1327: 220 kΩ (red-red-yellow).
- ( ) R1326: 4700 Ω, 1/4-watt (yellow-violet-red).
- ( ) R1329 15 kΩ (brown-green-orange)
- ( ) R1328: 15 kΩ (brown-green-orange).
- ( ) R1304: 150 kΩ (brown-green-yellow).
- ( ) R1306: 2200 Ω (red-red-red).
- ( ) R1309: 15 Ω (brown-green-black).
- ( ) Solder all leads to the foil and cut off the excess lead lengths.

CONTINUE

- ( ) R1353: 1000 Ω (brown-black-red).
- ( ) R1354: 560 Ω (green-blue-brown).
- ( ) R1355: 22 Ω (red-red-black).
- ( ) R1333: 47 kΩ (yellow-violet-orange).
- ( ) R1334: 47 kΩ (yellow-violet-orange).
- ( ) R1332: 39 kΩ, 10% (orange-white-orange-silver).
- ( ) R1325: 3300 Ω (orange-orange-red).
- ( ) R1335: 2200 Ω (red-red-red).
- ( ) R1336: 2200 Ω (red-red-red).
- ( ) R1301: 10 kΩ (brown-black-orange).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.
- ( ) R1336: 2200 Ω (red-red-red).
- ( ) R1333: 47 kΩ (yellow-violet-orange).
- ( ) R1356: 10 Ω (brown-black-black).
- ( ) R1325: 3300 Ω (orange-orange-red).
- ( ) R1332: 39 kΩ, 10% (orange-white-orange-silver).
- ( ) R1302: 47 kΩ (yellow-violet-orange).
- ( ) R1305: 15 kΩ (brown-green-orange).
- ( ) R1301: 10 kΩ (brown-black-orange).
- ( ) R1307: 15 kΩ (brown-green-orange).
- ( ) Solder the leads to the foil and cut off the excess lead lengths.

NOTE: Save the remaining four resistors.

PICTORIAL 1-3

START

NOTE: When you install a jumper wire in the following steps, cut the red wire to the indicated length and remove 1/4" of insulation from each end. Solder each wire to the foil as it is installed and cut off the excess wire lengths.

After a jumper wire has been installed, use a small screwdriver and press the wire down next to the circuit board.

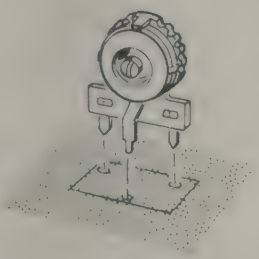
( ) 4-1/4" red wire.

( ) 3-1/2" red wire.

( ) 2-1/4" red wire.

NOTE: When you install components in the following steps, solder their lugs or leads to the foil as you install each component.

( ) R1316: 5000 Ω (5k) control (#10-311).



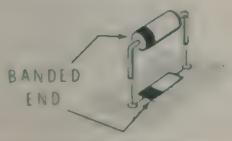
( ) R1316: 5000 Ω (5k) control (#10-311).

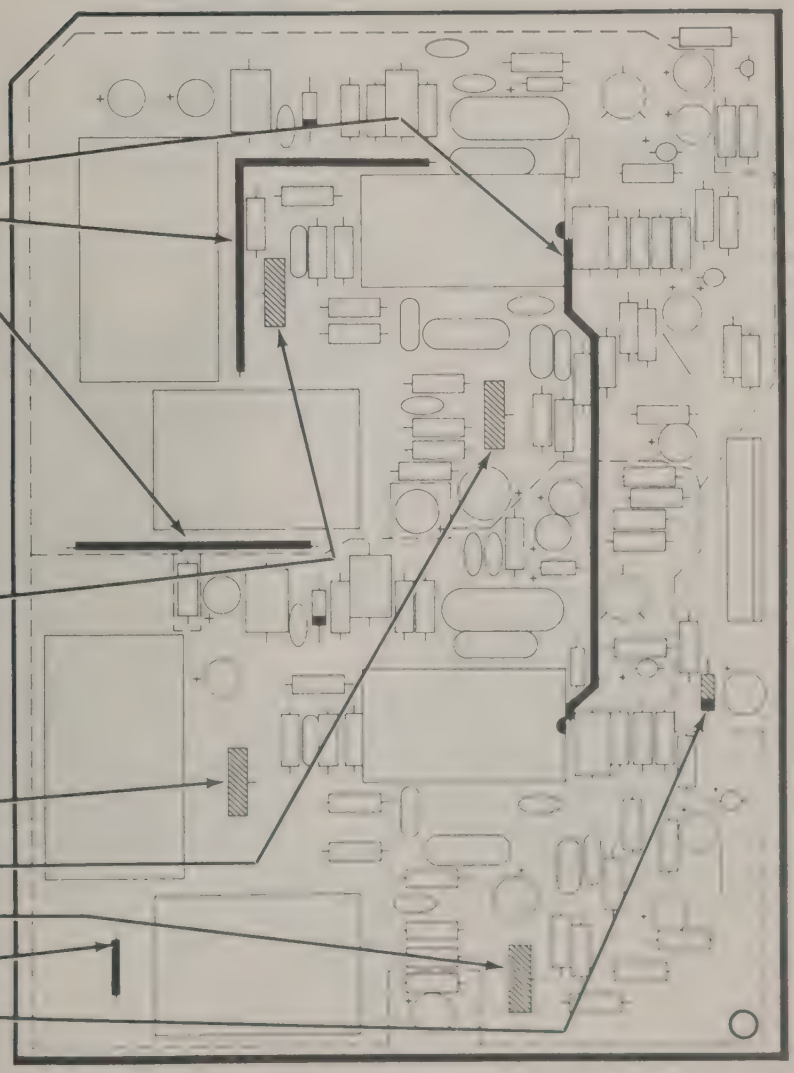
( ) R1308 500 Ω control (#10-918).

( ) R1308 500 Ω control (#10-918).

( ) 1" red wire.

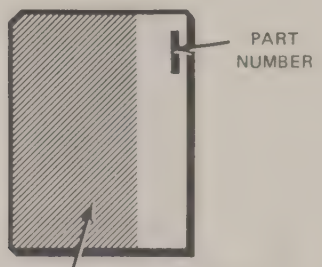
( ) ZD1351: 1N4744A zener diode (#56-90). Be sure to position the banded end of the diodes as shown on the circuit board.





PICTORIAL 1-4

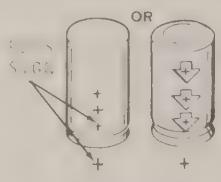
IDENTIFICATION DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

START

NOTE: When you install electrolytic capacitors, be sure to position the positive (+) lead of the capacitor toward the positive (+) mark on the circuit board.



( ) C1315: 5 μF electrolytic.

( ) C1307: 5 μF electrolytic.

( ) C1305: 250 μF electrolytic.

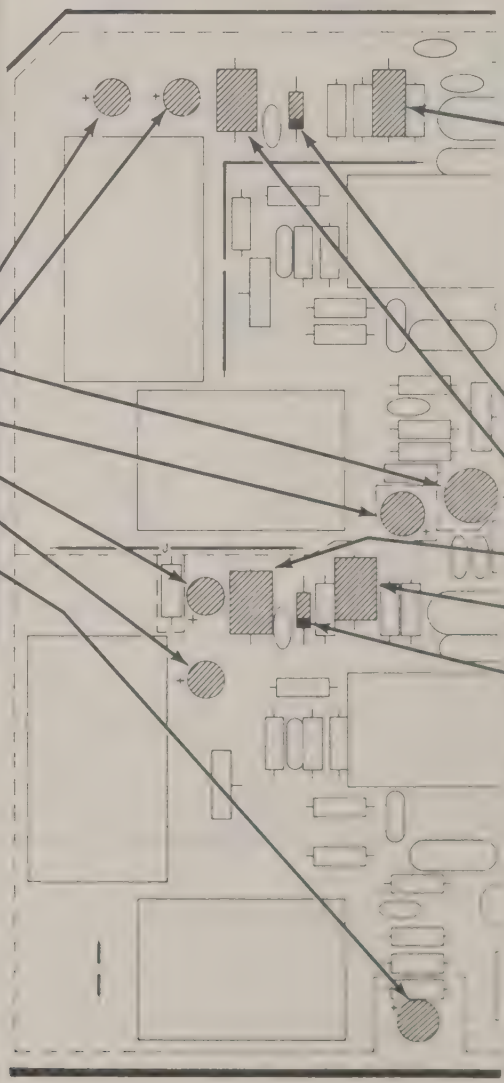
( ) C1352: 50 μF electrolytic.

( ) C1315: 5 μF electrolytic.

( ) C1307: 5 μF electrolytic.

( ) C1351: 5 μF electrolytic.

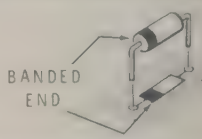
( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) C1316: 6800 pF (.0068 μF) polystyrene.

NOTE: When you install a diode, always match the band or bands on the diode with the band mark on the circuit board.



( ) D1301: 1N4149 diode (#56-56).

( ) C1313: 6800 pF (.0068 μF) polystyrene.

( ) C1313: 6800 pF (.0068 μF) polystyrene.

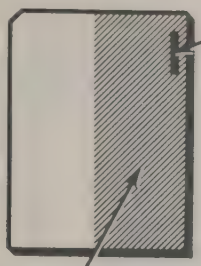
( ) C1316: 6800 pF (.0068 μF) polystyrene.

( ) D1301: 1N4149 diode (#56-56).

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-5

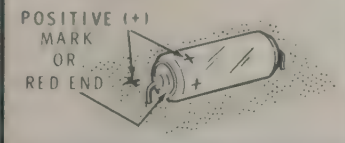
IDENTIFICATION DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

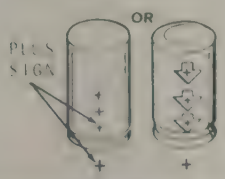
START

NOTE: When you install tantalum capacitors, always match the positive (+ or red) marked end of the capacitor with the positive (+) mark on the circuit board.



( ) C1322: 1 μF tantalum.

NOTE: When you install electrolytic capacitors, be sure to position the positive (+) lead of the capacitor toward the positive (+) mark on the circuit board.



( ) C1327: 5 μF electrolytic.

( ) C1326: 5 μF electrolytic.

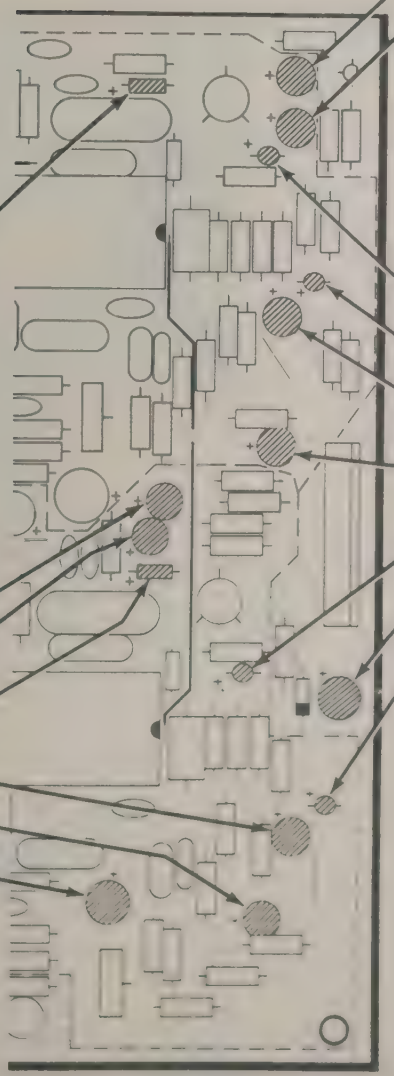
( ) C1322: 1 μF tantalum.

( ) C1301: 5 μF electrolytic.

( ) C1302: 5 μF electrolytic.

( ) C1305: 250 μF electrolytic.

( ) Solder all leads to the foil and cut off the excess lead lengths.

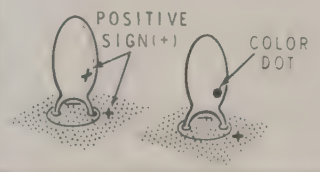


CONTINUE

( ) C1327: 5 μF electrolytic.

( ) C1326: 5 μF electrolytic.

NOTE: When you install a tantalum capacitor, always match the positive (+) or dot marked side of the capacitor with the positive (+) mark on the circuit board.



( ) C1319: 10 μF tantalum.

( ) C1323: 33 μF tantalum.

( ) C1301: 5 μF electrolytic.

( ) C1302: 5 μF electrolytic.

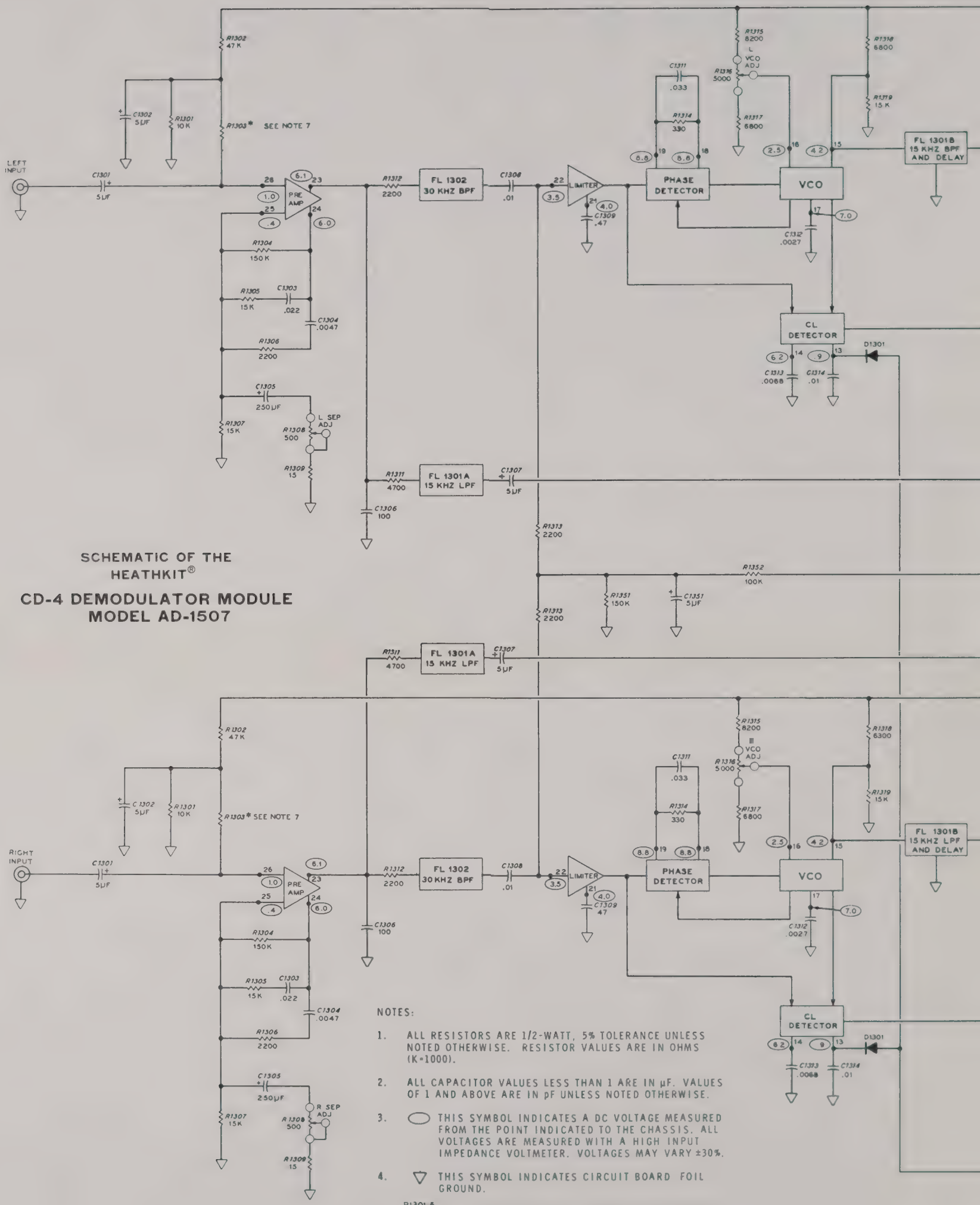
( ) C1319: 10 μF tantalum.

( ) C1353: 50 μF electrolytic.

( ) C1323: 33 μF tantalum.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-6

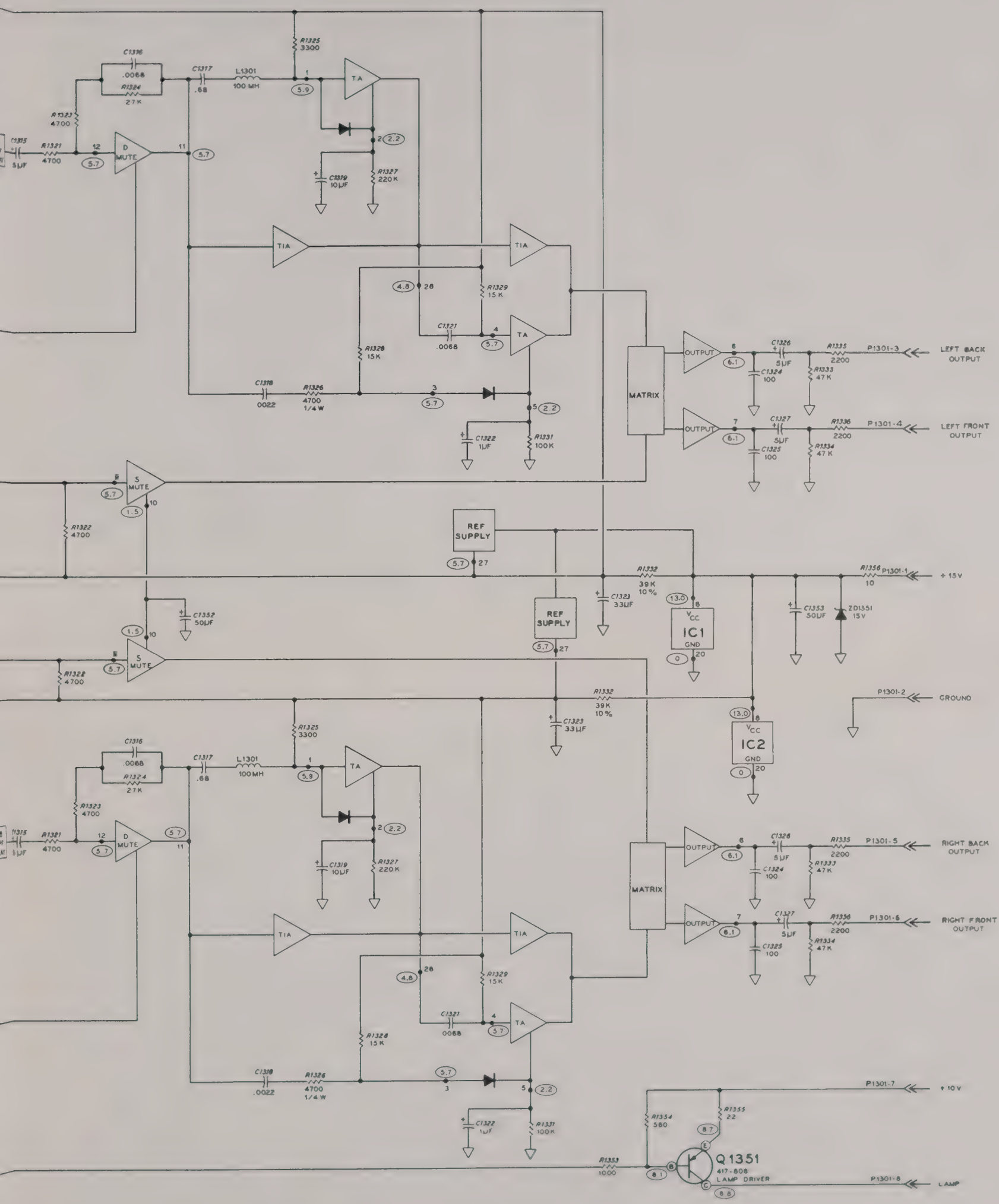


SCHEMATIC OF THE HEATHKIT®

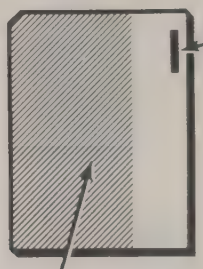
CD-4 DEMODULATOR MODULE MODEL AD-1507

NOTES:

1. ALL RESISTORS ARE 1/2-WATT, 5% TOLERANCE UNLESS NOTED OTHERWISE. RESISTOR VALUES ARE IN OHMS (K=1000).
2. ALL CAPACITOR VALUES LESS THAN 1 ARE IN µF. VALUES OF 1 AND ABOVE ARE IN pF UNLESS NOTED OTHERWISE.
3. ⬭ THIS SYMBOL INDICATES A DC VOLTAGE MEASURED FROM THE POINT INDICATED TO THE CHASSIS. ALL VOLTAGES ARE MEASURED WITH A HIGH INPUT IMPEDANCE VOLTMETER. VOLTAGES MAY VARY ±30%.
4. ▽ THIS SYMBOL INDICATES CIRCUIT BOARD FOIL GROUND.
5. P1301-5 ⟨ THIS SYMBOL INDICATES A CIRCUIT BOARD PLUG AND GIVING PLUG AND PIN NUMBER.
6. REFER TO THE CIRCUIT BOARD X-RAY VIEWS FOR THE PHYSICAL LOCATION OF PARTS.
7. * THIS RESISTOR VALUE IS EITHER 47KΩ OR 100KΩ.


C1316
.0068
R1324
27K
C1317
.68
L1301
100 MH
R1325
3300
TA
5.9
R1323
4700
C1315
5 µF
R1321
4700
12
5.7
D
MUTE
11
5.7
2
2.2
C1319
10µF
R1327
220K
TIA
TIA
TIA
4.8
28
R1329
15K
C1321
.0068
4
5.7
TA
R1328
15K
C1318
0022
R1326
4700
1/4 W
3
5.7
5
2.2
C1322
1µF
R1331
100K
MATRIX
OUTPUT
6
6.1
C1326
5µF
C1324
100
R1335
2200
R1333
47K
P1301-3
LEFT BACK
OUTPUT
OUTPUT
7
6.1
C1327
5µF
C1325
100
R1336
2200
R1334
47K
P1301-4
LEFT FRONT
OUTPUT
S
MUTE
5.7
1.5
10
R1322
4700
REF
SUPPLY
5.7
27
R1332
39K
10%
C1323
33µF
13.0
8
VCC
IC1
GND
0
20
C1353
50µF
ZD1351
15V
R1356
10
P1301-1
+15V
C1352
50µF
REF
SUPPLY
5.7
27
P1301-2
GROUND
R1332
39K
10%
C1323
33µF
13.0
8
VCC
IC2
GND
0
20
R1325
3300
C1316
.0068
R1324
27K
C1317
.68
L1301
100 MH
TA
5.9
R1323
4700
C1315
5 µF
R1321
4700
12
5.7
D
MUTE
11
5.7
2
2.2
C1319
10µF
R1327
220K
TIA
TIA
TIA
4.8
28
R1329
15K
C1321
0068
4
5.7
TA
R1328
15K
C1318
.0022
R1326
4700
1/4 W
5.7
3
5
2.2
C1322
1µF
R1331
100K
MATRIX
OUTPUT
6
6.1
C1326
5µF
C1324
100
R1335
2200
R1333
47K
P1301-5
RIGHT BACK
OUTPUT
OUTPUT
7
6.1
C1327
5µF
C1325
100
R1336
2200
R1334
47K
P1301-6
RIGHT FRONT
OUTPUT
P1301-7
+10V
R1354
560
R1355
22
8.7
E
Q1351
417-808
LAMP DRIVER
B
C
8.1
8.8
R1353
1000
P1301-8
LAMP

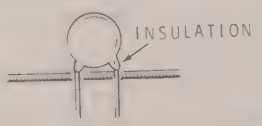
IDENTIFICATION
DRAWING



The steps performed in this Pictorial are in this area of the circuit board.

START

NOTE: When you install disc capacitors, do not push the insulated portion of the leads into the circuit board holes. This could make it difficult to solder the leads to the foil. Also the leads of the Mylar capacitors may be coated with a clear film. If any soldering problem is encountered with these capacitors, apply more heat to the leads to melt this film.



( ) C1314: .01 µF disc.

( ) C1311: .033 µF Mylar.

( ) C1314: .01 µF disc.

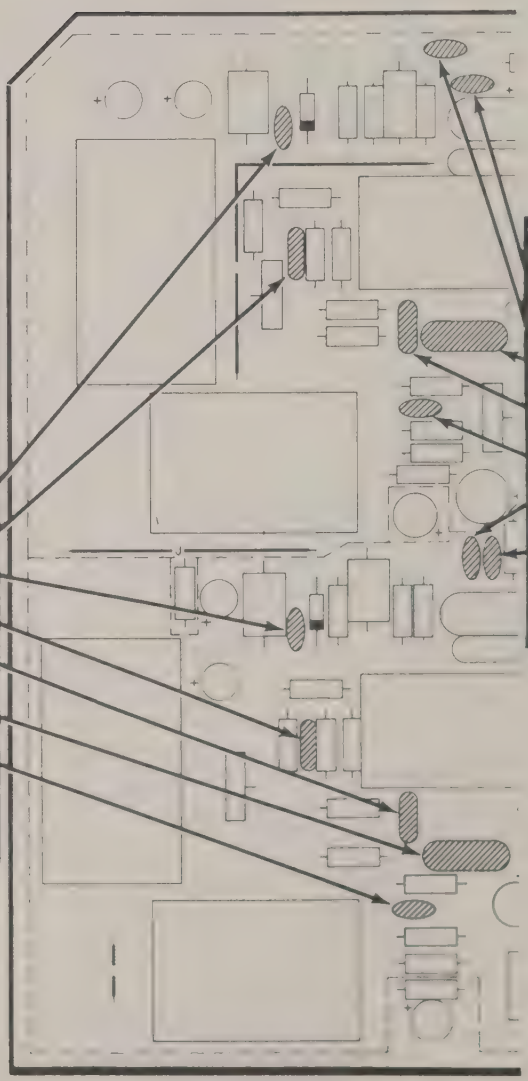
( ) C1311: .033 µF Mylar.

( ) C1312: .0027 µF (2700 pF) Mylar.

( ) C1309: .47 µF Mylar.

( ) C1308: .01 µF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.



CONTINUE

( ) C1324: 100 pF disc.

( ) C1325: 100 pF disc.

( ) C1309: .47 µF Mylar.

( ) C1312: .0027 µF (2700 pF) Mylar.

( ) C1308: .01 µF disc.

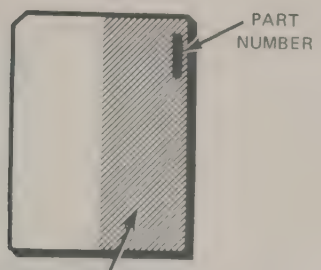
( ) C1325: 100 pF disc.

( ) C1324: 100 pF disc.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-7

IDENTIFICATION DRAWING

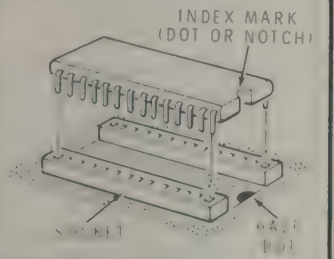


The steps performed in this Pictorial are in this area of the circuit board.

START

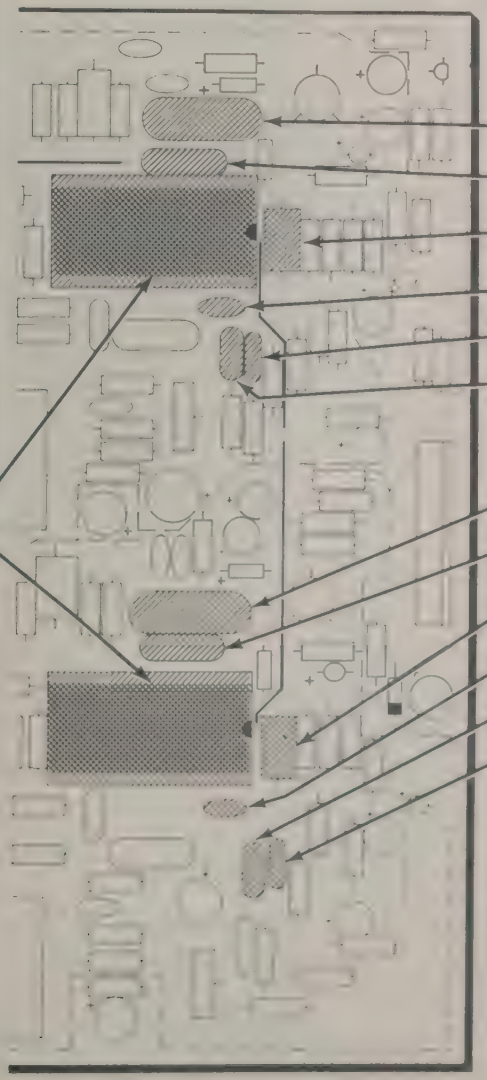
In the following steps, install IC's in the designated sockets. Be careful to match the index mark on the IC with the half dot on the circuit board. See the illustration below.

Before you apply downward pressure to an IC, make sure each pin is straight and properly started into the socket. Then push the IC down into the socket.



( ) IC1301: QSI 5022 IC (#442-605).

( ) IC1301: QSI 5022 IC (#442-605).



CONTINUE

( ) C1317 .68 μF Mylar

( ) C1318: .0022 μF (2200 pF) Mylar.

( ) C1321: .0068 μF (6800 pF) polystyrene.

( ) C1306: 100 pF disc.

( ) C1303: .022 μF Mylar.

( ) C1304: .0047 μF (4700 pF) Mylar.

( ) Solder the leads to the foil and cut off the excess lead lengths.

( ) C1317: .68 μF Mylar.

( ) C1318: .0022 μF Mylar.

( ) C1321: .0068 μF (6800 pF) polystyrene.

( ) C1306: 100 pF disc.

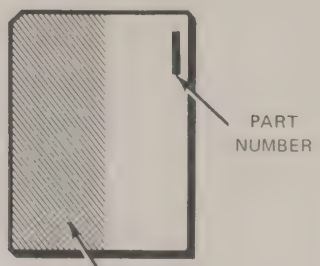
( ) C1304: .0047 μF (4700 pF) Mylar.

( ) C1303: .022 μF Mylar.

( ) Solder the leads to the foil and cut off the excess lead lengths.

PICTORIAL 1-8

IDENTIFICATION DRAWING

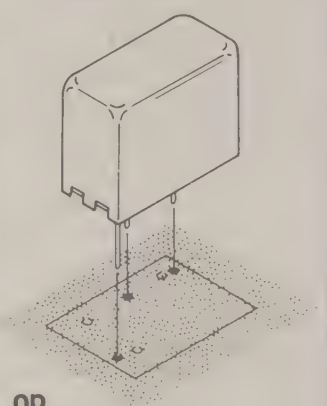


The steps performed in this Pictorial are in this area of the circuit board.

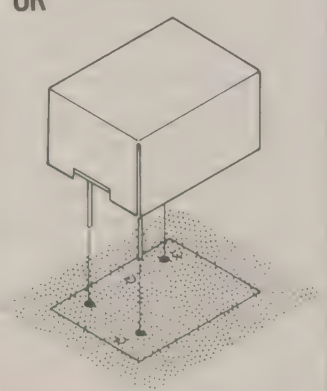
START

NOTE: The LC filters you install in the next two steps can be supplied in either of two ways. Refer to the Detail below that corresponds to the filter you received.

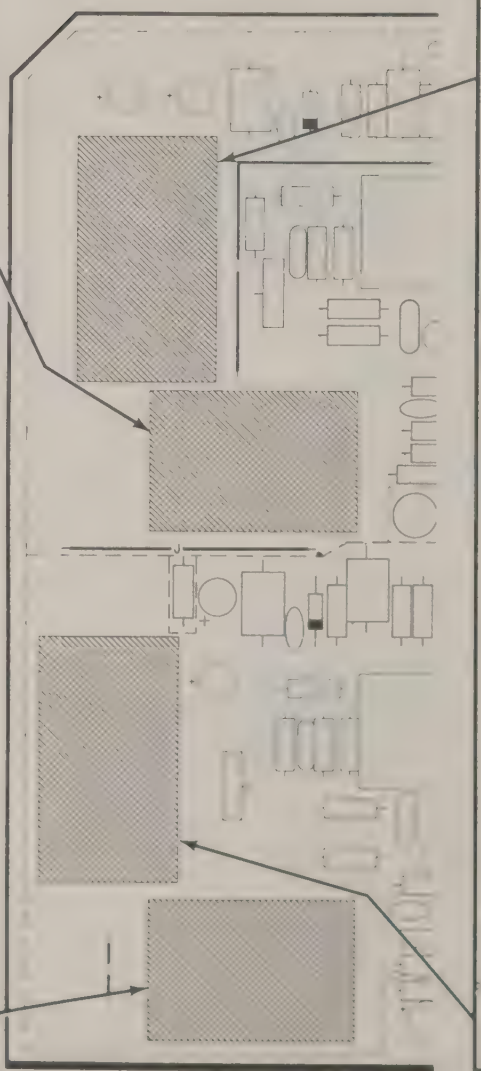
( ) FL1302: LC filter (#52-174) Solder all pins to the foil and cut off the excess pin lengths.



OR



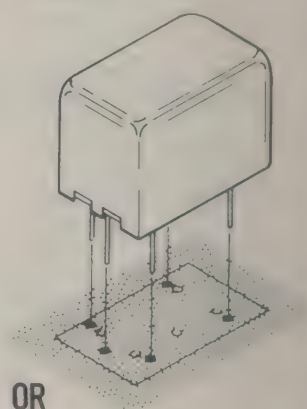
( ) FL1302: LC filter (#52-174). Solder all pins to the foil and cut off the excess pin lengths.



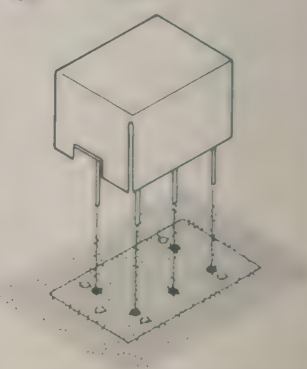
CONTINUE

NOTE: The LC filters you install in the next two steps can be supplied in either of two ways. Refer to the Detail below that corresponds to the filter you received.

( ) FL1301: LC filter (#52-173). Install the filter by pushing the connector pins into the proper holes on the circuit board. Carefully straighten any bent pins that prevent easy installation. Solder all pins to the foil and cut off the excess pin lengths.



OR



( ) FL1301: LC filter (#52-173). Solder all pins to the foil and cut off the excess pin lengths.

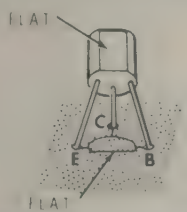
PICTORIAL 1-9

IDENTIFICATION DRAWING

The steps performed in this Pictorial are in this area of the circuit board.

START

IMPORTANT: In the next step, install the transistor in the manner shown. First line up the flat on the transistor with the outline of the flat on the circuit board. Then insert the transistor leads into their correct holes, indicated by E, C, and B. Push the transistor down to 1/4" above the circuit board. Solder the leads to the foil and cut off the excess lead lengths.



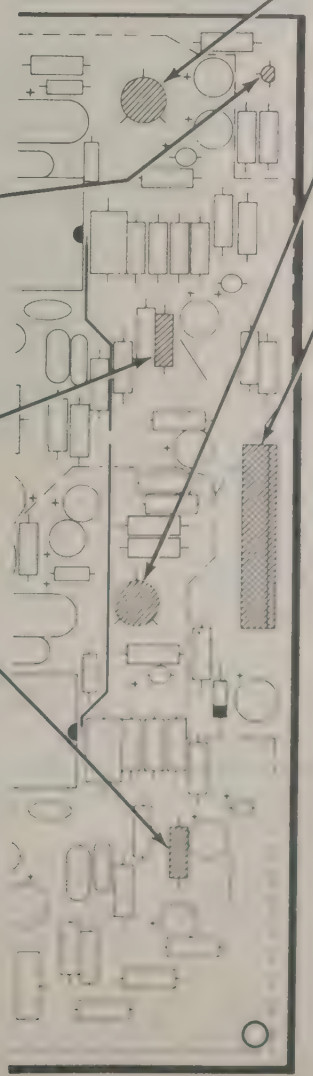
( ) Q1351: 2N3702 (#417-808).

NOTE: The resistors you will install in the next two steps will be either 47 kΩ or 100 kΩ. Refer to the manufacturer's specification sheet for the proper termination resistors for the CD-4 cartridge you intend to use.

( ) R1303: 47 kΩ (yellow-violet-orange) OR 100 kΩ (brown-black-yellow).

( ) R1303: 47 kΩ (yellow-violet-orange) OR 100 kΩ (brown-black-yellow).

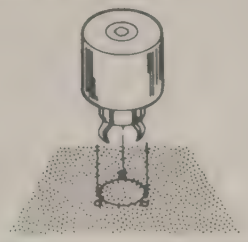
( ) Solder all leads to the foil and cut off the excess lead lengths.



PICTORIAL 1-10

CONTINUE

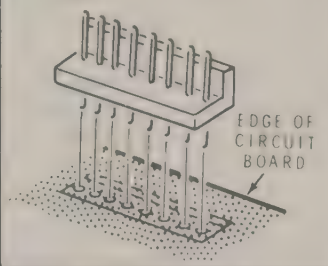
NOTE: Install the following coils as shown and solder the lugs to the foil.



( ) L1301: 100 mH (#40-1808).

( ) L1301: 100 mH (#40-1808).

( ) 8-pin connector. Solder all pins to the foil.



CIRCUIT BOARD CHECKOUT

It is important that the following checkout procedure be done after you complete the circuit board.

Visual Inspection

Carefully inspect the circuit board for the following conditions.

( ) Unsoldered connections.

( ) "Cold" solder connections.

( ) Solder bridges between foil patterns.

( ) Protruding leads. No lead should be longer than 1/8".

( ) Integrated circuits for the proper installation.

( ) Electrolytic capacitors for the correct position of the positive (+) end.

( ) Transistor for the proper installation.

( ) Diodes for the correct position at the banded end.

FINISH

Proceed to the "CD-4 Demodulator Module" section in the Manual of the kit that you intend to install this circuit board into.

IN CASE OF DIFFICULTY

This section of the Manual is divided into two parts. The first part, titled "General Troubleshooting Information," describes what to do about the difficulties that may occur right after your unit is assembled and installed.

The second part, titled "Troubleshooting Chart," will help you service your unit if the "General Troubleshooting Information" fails to clear up the problems, or if difficulties occur after your unit has been in use for some time. The "Troubleshooting Chart" lists a number of possible difficulties that could arise, along with several possible solutions to those difficulties.

Try to analyze the symtoms of any problem you might have before starting any troubleshooting procedure. A review of the "Circuit Description" may help your analysis.

NOTE: Refer to the "Circuit Board X-Ray Views" on Page 24 for the physical location of parts on the circuit board.

GENERAL TROUBLESHOOTING INFORMATION

1. About 90% of the kits that are returned for repair do not function properly because of poor connections and soldering. Therefore, many troubles can be located by a careful inspection of connections to make sure they are soldered as described in the "Soldering" section of the "Kit Builders Guide." Reheat any doubtful connections.

2. Closely examine each circuit board foil in a good light to see that no solder bridges exist between adjacent connections. If available, a magnifying glass would be helpful for this purpose. Remove any solder bridges by holding a clean, hot soldering iron tip between the two points that are bridged until the excess solder flows down onto the tip. Compare your foil pattern against the "X-Ray Views" on Page 24.

3. Be sure that each transistor lead is in the right hole and has a good solder connection to the foil. Recheck to see if you installed them as shown on Page 19.

4. Check the integrated circuits for proper positioning. (Be sure the keyed end of the IC is over the half dot printed on the circuit board. This is the end that has number 1 printed outside the IC outline.) Be sure each IC pin is making good contact with its connector, and is not bent out or under the IC.

5. Check each capacitor value. Be sure that a capacitor of correct value is installed at each capacitor location. Check each electrolytic capacitor to be sure the lead near the positive (+) marking is at the correct position.

6. Check each resistor value carefully. It would be easy, for example, to install a 22 Ω (red-red-black) resistor where a 2200 Ω (red-red-red) resistor is called for. A resistor that is discolored, or cracked, or shows any sign of bulging would indicate that it is damaged and should be replaced. Since damaged resistors are often the result of some other difficulty (such as faulty wiring), you should try to find out what caused the damage before you replace the part.

7. Be sure the correct diode is installed at each diode location, and that the banded end is positioned correctly.

If you still cannot locate and correct the trouble after the above tests are completed, and if a voltmeter is available, check your voltages against the voltages shown on the Schematic Diagram (fold-in) and in the "Circuit Board Voltage Charts" (Pages 26 and 27).

NOTE: In an extreme case where you are unable to resolve a difficulty, refer to the "Customer Service" information inside the rear cover of the Manual. Your Warranty is located inside the front cover of the Manual.

Precautions for Troubleshooting

WARNING: Be very careful when you measure voltages to prevent damaging circuit board components.

1. Be sure you do not short any adjacent foils when you make voltage measurements. If the probe should slip, for example, and short together two adjacent connections, it is very likely that you will damage the IC's, diodes, or transistor.
2. Be especially careful when you test any circuit that contains an IC or a transistor. Although these components have an almost unlimited life when used properly, they are much more vulnerable to damage from excessive voltage or current than many other parts.

Troubleshooting Chart

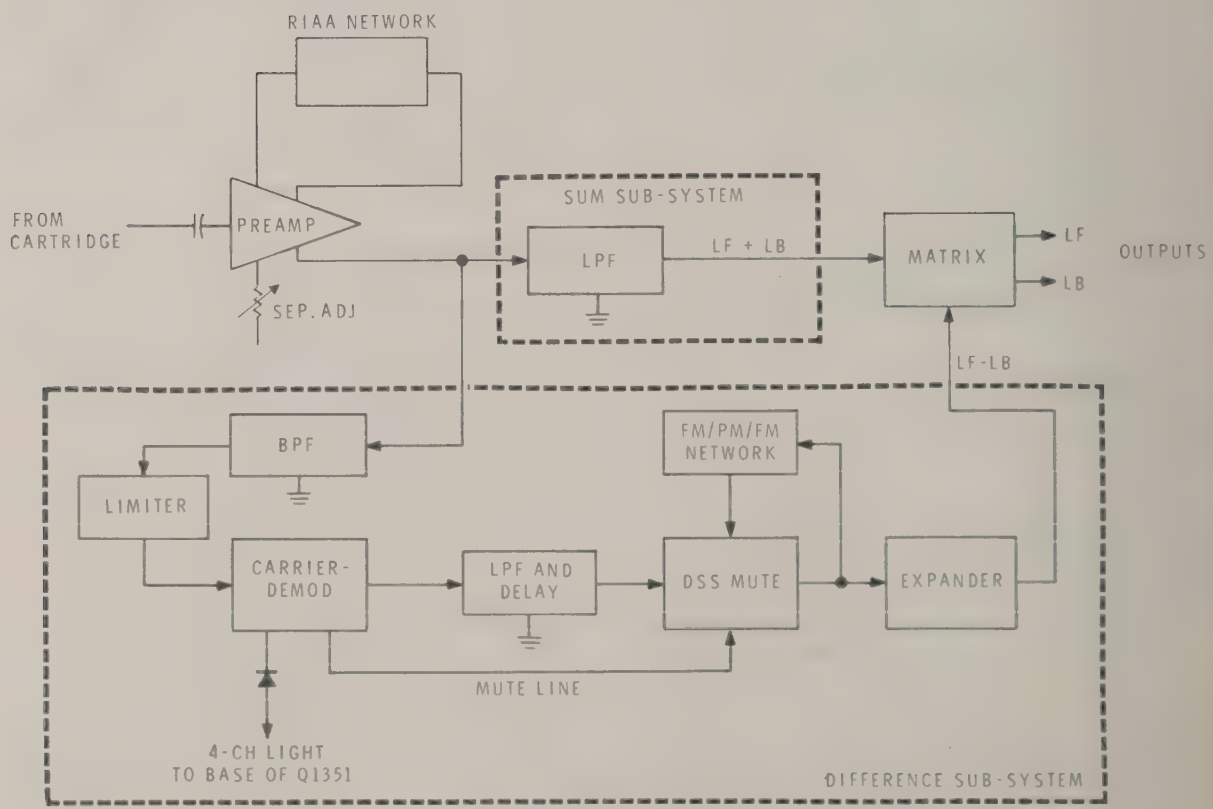
This chart lists the condition and possible cause of several malfunctions. If a particular part or parts are mentioned (D1301 for example) as a possible cause, check that part to see that it was installed and/or wired correctly. It is also possible, on rare occasions, for a part to be faulty and require replacement.

CONDITION	POSSIBLE CAUSE
No audio output. CD-4 indicator will not light.	1. CD-4 button not pushed in. 2. Audio input cables improperly installed. 3. Audio input cable open. 4. Audio input signal shorted to ground.
Audio output, but CD-4 indicator will not light.	1. 4-CHAN button is not depressed. 2. Record is not CD-4 type (no 30 kHz carrier present). 3. Incorrect turntable speed. 4. Transistor Q1351 incorrectly installed or defective. 5. Diode D1301 installed backwards or defective. 6. Integrated circuit IC1301. 7. Controls R1316 (VCO Adjust) improperly adjusted.
Audio output. CD-4 indicator lights, but no front-to-back separation. (No signal is reaching the matrix section of IC1301 in either the low band or the high band paths.)	1. Controls R1308 (Separation Adjust) improperly adjusted. 2. Filter FL1301A, FL1301B or FL1302 defective. 3. IC1301 defective.
No noise reduction in one channel.	1. Coil L1301 open. 2. IC1301 defective.

SPECIFICATIONS

Front-to-Back Separation	≧ 20dB.
Total Harmonic Distortion at 1 kHz	< 1%.
Frequency Response, ±3 dB	20 Hz – 13 kHz.

The Heath Company reserves the right to discontinue products and to change specifications at any time without incurring any obligation to incorporate new features in products previously sold.



CD-4 DEMODULATOR BLOCK DIAGRAM. LEFT SIDE. RIGHT SIDE IS IDENTICAL.

BLOCK DIAGRAM

CIRCUIT DESCRIPTION

Refer to the Block Diagram on Page 22 and to the Schematic (fold-in) while you read this "Circuit Description."

The left and right channels are identical. Therefore, only one channel and the reference supply will be described. The signal generated in the phono cartridge is coupled through capacitor C1301 to the input of the preamplifier, at pin 26 of IC1301. Resistor R1303 provides bias voltage for the preamplifier. R1305, C1303, C1304, and R1306 make up the RIAA phono equalization network for the preamplifier. Separation Adjust control, R1308, varies the gain of the preamplifier, which in turn causes the level of the sum signal to vary with respect to the difference signal at the matrix. The difference signal, being detected FM, is not affected by amplitude changes in the preamplifier stage previous to detection.

The preamplifier output at pin 23 of IC1301 is divided into two paths. One part of the signal, called the sum sub-system (SSS) signal, is allowed to pass through the 15 kHz low-pass filter (LPF), FL1301A, to pin 9 of IC1301. The other part of the signal, called the difference sub-system (DSS) signal, passes through the 30 kHz band-pass filter (BPF), FL1302, to pin 22 of IC1301. The DSS signal (modulated 30 kHz carrier) is then limited, detected, equalized, and expanded in time to reach the matrix block at exactly the same time as its SSS counterpart.

At pin 22 of IC1301, the DSS signal is fed into the limiter which provides a constant amplitude carrier to the phase-locked loop (PLL) FM demodulator. The limiter also helps to insure that the level of the 30 kHz carrier is sufficient to prevent carrier dropout problems.

The PLL circuit used for FM detection of the difference sub-system signal consists of a phase detector and a voltage-controlled oscillator (VCO). The carrier signal from the limiter and the VCO signal are both fed into the phase detector. The product of these two signals appears at the PLL filter terminals (pins 18 and 19). R1316 is used to adjust the VCO to 30 kHz. The carrier level (CL) detector unmutes the difference sub-system and turns on the CD-4 light when proper carrier level output from the limiter is attained and the PLL locks to the 30 kHz carrier.

The detected audio signal is fed to LPF F1301B where the remaining 30 kHz and other unwanted signals above 15 kHz are removed. When the carrier level drops below a specified value, the DSS signal is muted. The feedback components C1316 and R1324 of the DSS mute make up the FM/PM/FM de-emphasis network for high frequency roll-off. The DSS signal passes into the expander, which automatically reduces noise in two regions of the audio spectrum at 630 Hz and 10 kHz.

After leaving the expander, the difference signal finally arrives at the matrix input. The matrix block combines the audio sum signal and the audio difference signal to reproduce the discrete front and back signals of a 4-channel system. The front channel information passes from pin 6 of IC1301, through coupling capacitor C1326 and isolation resistor R1335, to the selector switch. The back channel information passes from pin 7 of IC1301, and through capacitor C1327 and resistor R1336 to the selector switch.

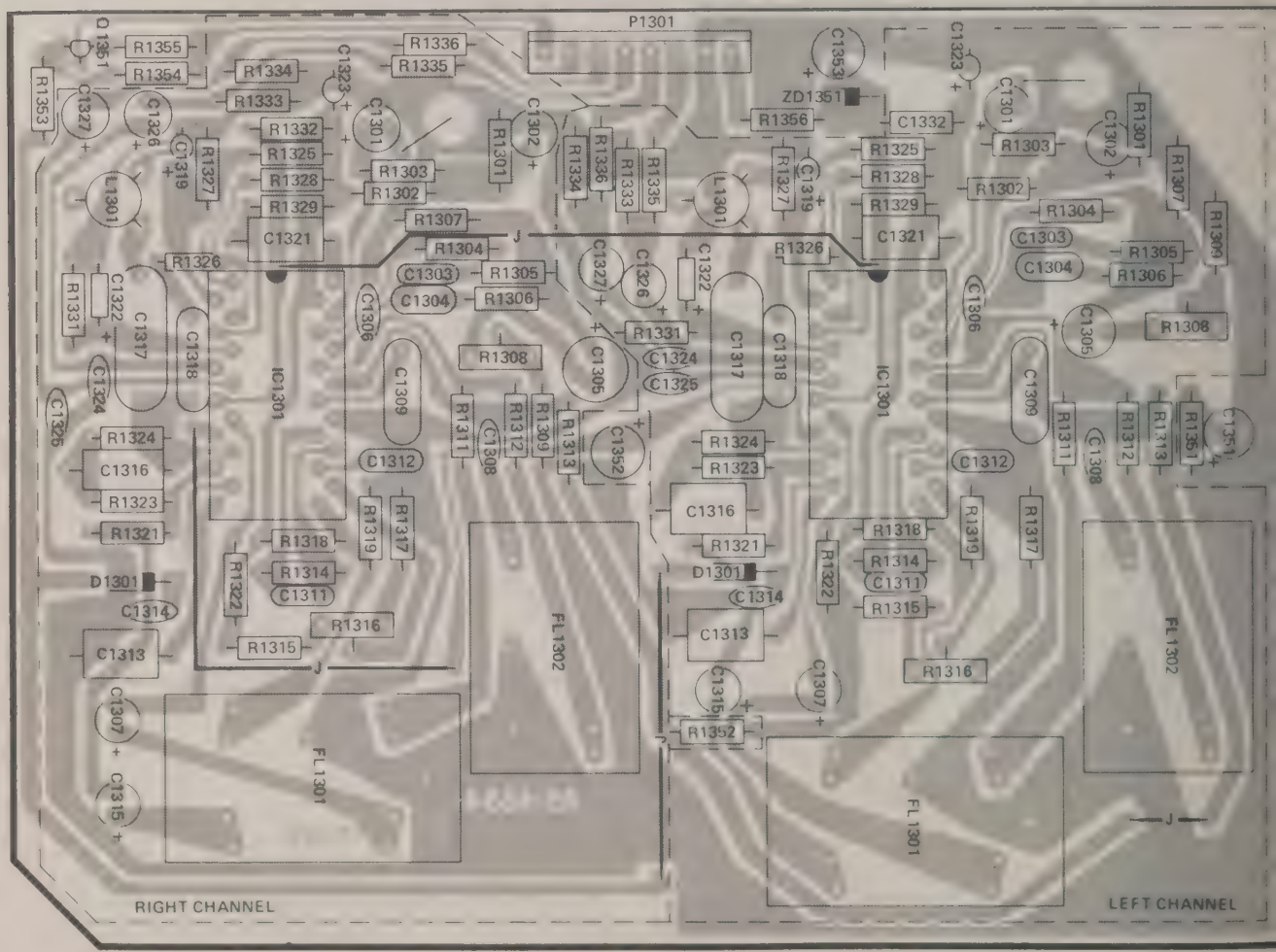
CIRCUIT BOARD X-RAY VIEWS

NOTE: To find the PART NUMBER of a component for the purpose of ordering a replacement part:

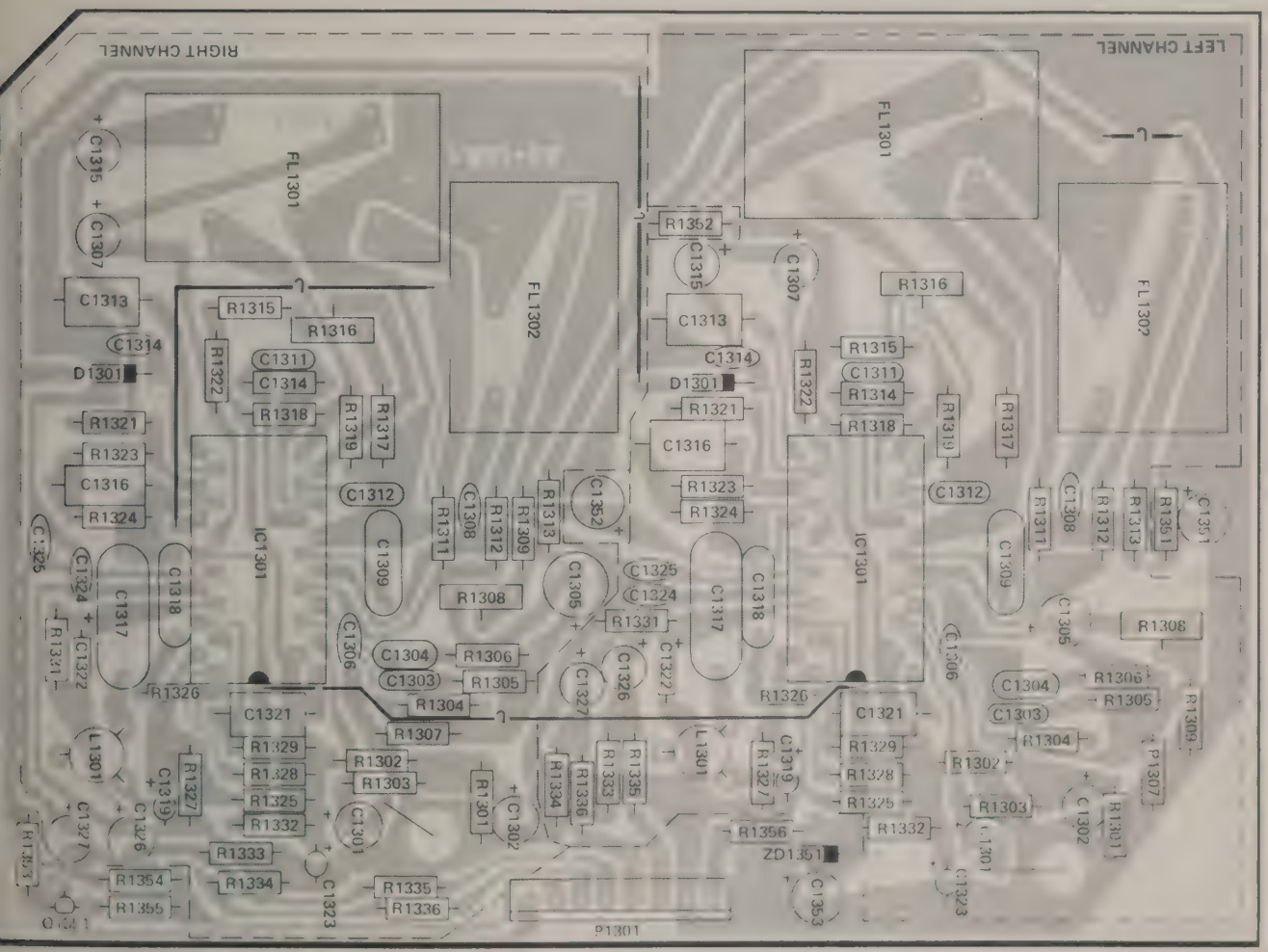
A. Find the circuit component number (R1305, C1303, etc.) on the "X-Ray View" or "Chassis Photograph."

B. Locate this same number in the "Circuit Component Number" column of the "Parts List."

C. Adjacent to the circuit component number, you will find the PART NUMBER and DESCRIPTION which must be supplied when you order a replacement part.

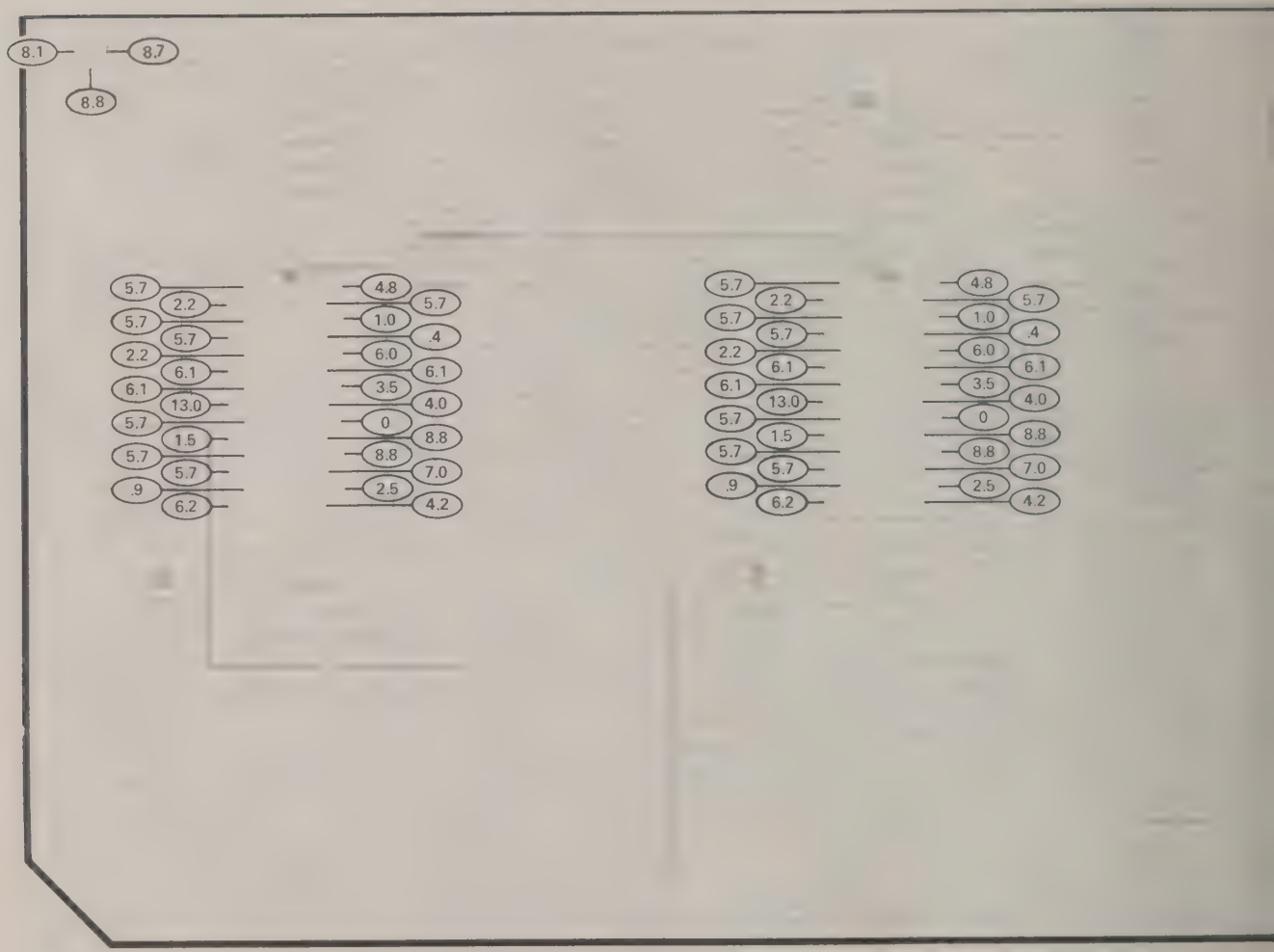


(Viewed from lettered side)

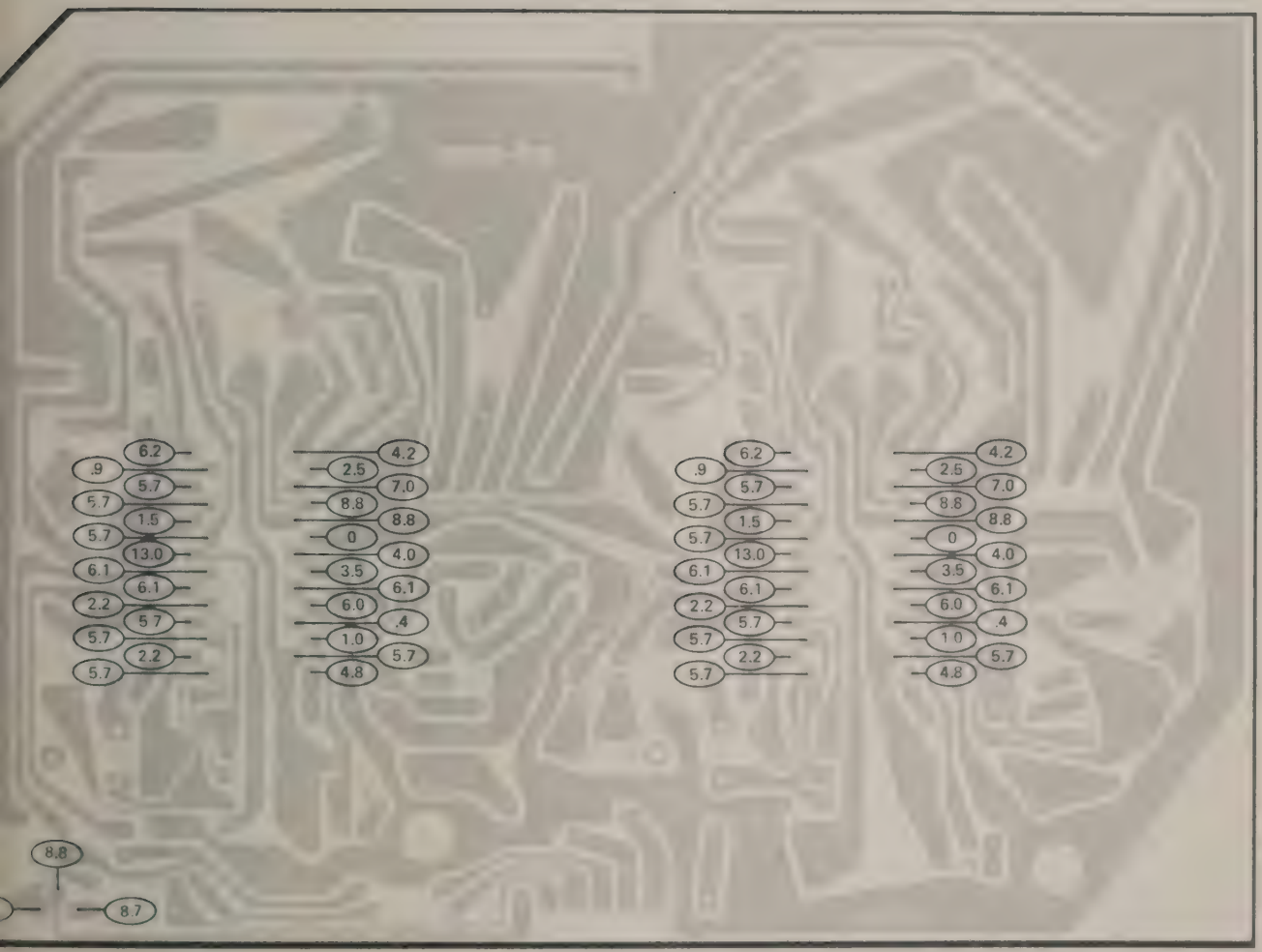


(Viewed from foil side)

CIRCUIT BOARD VOLTAGE CHARTS

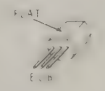
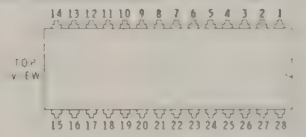


(Viewed from lettered side)



(Viewed from foil side)

IDENTIFICATION CHART

COMPONENT	HEATH PART NUMBER	MAY BE REPLACED WITH	IDENTIFICATION
D1301	56-56	1N4149 SILICON DIODE, 10mA, 75V	NOTE: HEATH PART NUMBERS ARE STAMPED ON MOST DIODES.
ZD1351	56-90 56-620	1N4744A ZENER DIODE, 15V, 1W, ±5%	
Q1351	417-808	2N3702	
IC1301	442-605	QSI 5022	 1. Mid Band Rect. Input 2. Mid Band Filter 3. High Band Rect. Inp. 4. High Band Input 5. High Band Filter 6. Rear Output 7. Front Output 8. +Vcc 9. Main Mute Input 10. Main Mute Drive 11. Sub Mute Output 12. Sub Mute Input 13. LED Drive 14. Sub Mute Control 15. Demod. Output 16. VCO Freq. Adjust 17. VCO Capacitor 18. PLL Filter 19. PLL Filter 20. Ground 21. Limiter Filter 22. Limiter Input 23. Preamp Output (-) 24. Preamp Output((+) 25. Preamp Feedback 26. Preamp Input 27. Reference Voltage 28. Mid Band Output

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
- Be sure you list the correct **HEATH** part number exactly as it appears in the parts list.
- If you wish to prepay your order, mail this card and your payment in an envelope. Be sure to include 10% (25¢ minimum, $3.50 maximum) for insurance, shipping and handling. Michigan residents add 4% tax.

  Total enclosed $_____
- If you prefer COD shipment, check the COD box and mail this card. COD ☐

NAME _____

ADDRESS _____

CITY _____

STATE _____ ZIP _____

The information requested in the next two lines is not required when purchasing nonwarranty replacement parts, but it can help us provide you with better products in the future.

Model # _____ Invoice # _____

Date Purchased _____ Location Purchased _____

LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

THIS FORM IS FOR U.S. CUSTOMERS ONLY
OVERSEAS CUSTOMERS SEE YOUR DISTRIBUTOR

CUT ALONG DOTTED LINE

FOR PARTS REQUESTS ONLY

- Be sure to follow instructions carefully.
- Use a separate letter for all correspondence.
- Please allow 10 - 14 days for mail delivery time.

DO NOT WRITE IN THIS SPACE

INSTRUCTIONS

- Please print all information requested.
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STATE _____ ZIP _____

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LIST **HEATH** PART NUMBER	QTY.	PRICE EACH	TOTAL PRICE
TOTAL FOR PARTS			
HANDLING AND SHIPPING			
MICHIGAN RESIDENTS ADD 4% TAX			
TOTAL AMOUNT OF ORDER			

SEND TO: **HEATH COMPANY**
BENTON HARBOR
MICHIGAN 49022
ATTN: PARTS REPLACEMENT

Phone (Replacement parts only): 616 982-3571

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CUSTOMER SERVICE

REPLACEMENT PARTS

Please provide complete information when you request replacements from either the factory or Heath Electronic Centers. Be certain to include the **HEATH** part number exactly as it appears in the parts list.

Replacement parts are maintained specifically to repair Heath products. Parts sales for other reasons will be declined.

ORDERING FROM THE FACTORY

Print all of the information requested on the parts order form furnished with this product and mail it to Heath. For telephone orders (parts only) dial 616 982-3571. If you are unable to locate an order form, write us a letter or card including:

- Heath part number.
- Model number.
- Date of purchase.
- Location purchased or invoice number.
- Nature of the defect.
- Your payment or authorization for COD shipment of parts not covered by warranty.

Mail letters to: Heath Company
Benton Harbor
MI 49022
Attn: Parts Replacement

Retain original parts until you receive replacements. Parts that should be returned to the factory will be listed on your packing slip.

OBTAINING REPLACEMENTS FROM HEATH ELECTRONIC CENTERS

For your convenience, "over the counter" replacement parts are available from the Heath Electronic Centers listed in your catalog. Be sure to bring in the original part and purchase invoice when you request a warranty replacement from a Heath Electronic Center.

TECHNICAL CONSULTATION

Need help with your kit? — Self-Service? — Construction? — Operation? — Call or write for assistance. you'll find our Technical Consultants eager to help with just about any technical problem except "customizing" for unique applications.

The effectiveness of our consultation service depends on the information you furnish. Be sure to tell us:

- The Model number and Series number from the blue and white label.
- The date of purchase.
- An exact description of the difficulty.
- Everything you have done in attempting to correct the problem.

Also include switch positions, connections to other units, operating procedures, voltage readings, and any other information you think might be helpful.

Please do not send parts for testing, unless this is specifically requested by our Consultants.

Hints: Telephone traffic is lightest at midweek — please be sure your Manual and notes are on hand when you call.

Heathkit Electronic Center facilities are also available for telephone or "walk-in" personal assistance.

REPAIR SERVICE

Service facilities are available, if they are needed, to repair your completed kit. (Kits that have been modified, soldered with paste flux or acid core solder, cannot be accepted for repair.)

If it is convenient, personally deliver your kit to a Heathkit Electronic Center. For warranty parts replacement, supply a copy of the invoice or sales slip.

If you prefer to ship your kit to the factory, attach a letter containing the following information directly to the unit:

- Your name and address.
- Date of purchase and invoice number.
- Copies of all correspondence relevant to the service of the kit.
- A brief description of the difficulty.
- Authorization to return your kit COD for the service and shipping charges. (This will reduce the possibility of delay.)

Check the equipment to see that all screws and parts are secured. (Do not include any wooden cabinets or color television picture tubes, as these are easily damaged in shipment. Do not include the kit Manual.) Place the equipment in a strong carton with at least THREE INCHES of *resilient* packing material (shredded paper, excelsior, etc.) on all sides. Use additional packing material where there are protrusions (control sticks, large knobs, etc.). If the unit weighs over 15 lbs., place this carton in another one with 3/4" of packing material between the two.

Seal the carton with reinforced gummed tape, tie it with a strong cord, and mark it "Fragile" on at least two sides. Remember, the carrier will not accept liability for shipping damage if the unit is insufficiently packed. Ship by prepaid express, United Parcel Service, or insured Parcel Post to:

Heath Company
Service Department
Benton Harbor, Michigan 49022

HEATH

Schlumberger

MP MASTER

MA22833

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